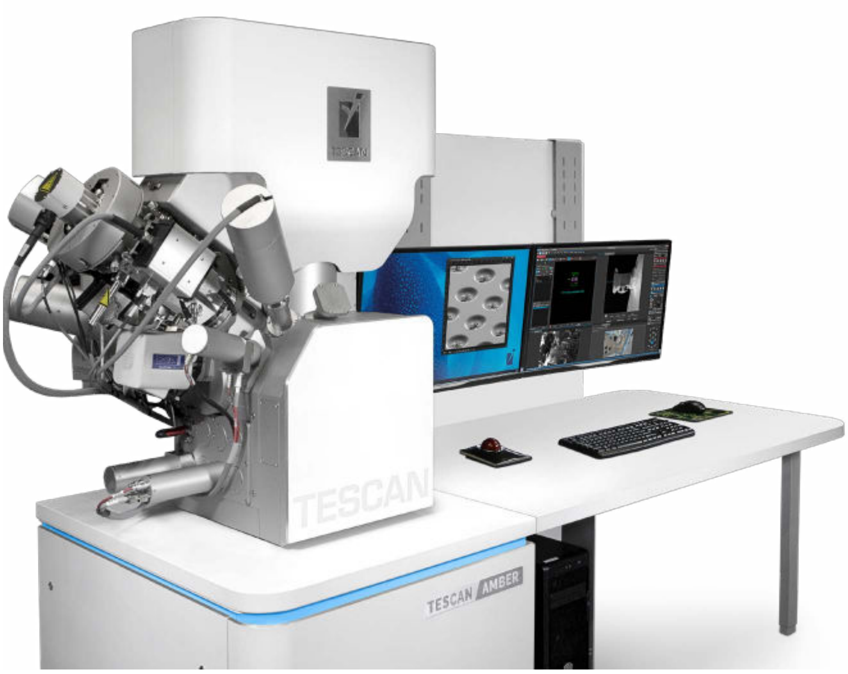
TESCAN AMBER FIB-SEM

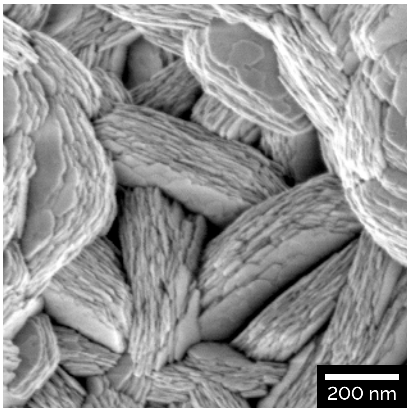
UHR SEM and Ga FIB to cover a broad range of nanoscale characterization, 3D analysis and sample preparation requirements

Field-free UHR SEM	TEM prep	Microanalysis
Ga FIB (up to 100 nA)	3D FIB-SEM tomography	Nanofabrication

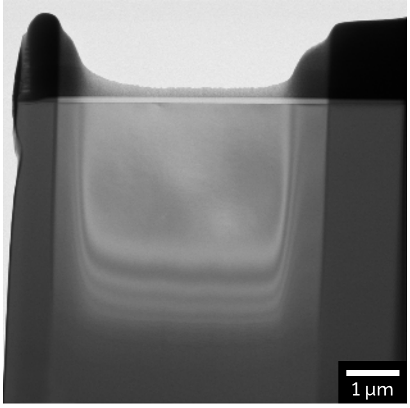
TESCAN AMBER: Nanoscale materials characterization and sample preparation with multi-user lab requirements in mind



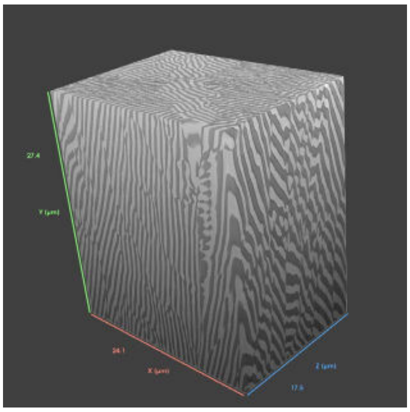
Reliable, robust, and versatile, TESCAN AMBER is the ideal solution for multi-user laboratories that a routine require ultra-high-resolution imaging and analysis on a diverse range of samples.



▲ Ni rich Li powder imaged at 500eV in Beam Deceleration Mode (BDM) with Axial SE



▲ TEM image of Silicon sample prepared by TESCAN AMBER



▲ 3D Visualization of AlCu eutectic structure

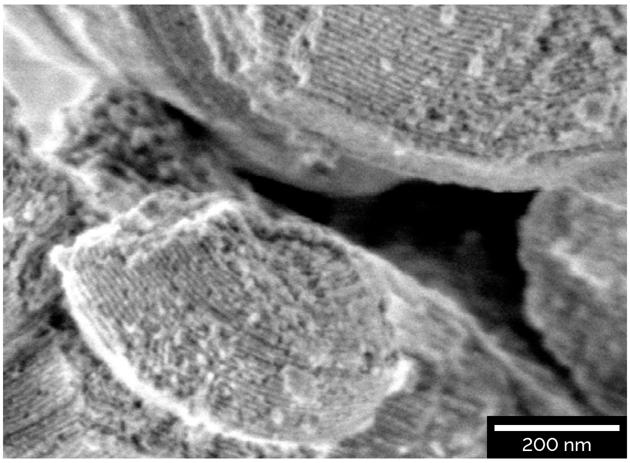
With today's novel materials being of mixed compositions, smaller scale and more delicate when compared to materials of the past, TESCAN AMBER's field-free UHR SEM delivers the low keV, high surface sensitivity imaging performance that is needed for accurate visualization of surface topography, material contrast and detail on these types of samples.

And when further investigation is required to complete the characterization, AMBER's Ga FIB column goes to work to precisely prepare samples for sub-surface imaging or other techniques, like TEM, atom probe tomography and mechanical testing. But AMBER's utility doesn't end with the routine tasks. AMBER can be equipped with options that extend its capabilities to advanced applications like Time-of-Flight SIMS, fabrication and prototyping, 3D tomography, and lift-out solutions for advanced TEM sample preparation from novel materials.

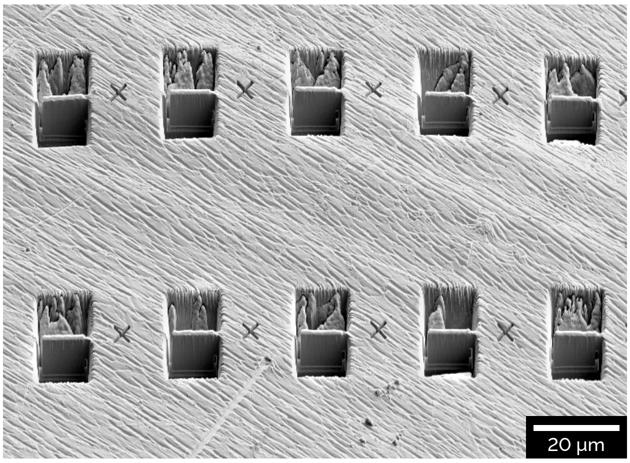
The Most Valued Features for Academic and Industrial Research Labs

- Field-free ultra-high-resolution (UHR) SEM with BrightBeam™ Optics for low keV imaging
- Orage™ Ga FIB column with beam currents up to 100 nA
- Four detectors as standard: in-column SE and BSE; chamber-mounted SE (Everhart-Thornley) and retractable BSE
- Powerful Essence™ GUI with fully integrated software modules
- The industry’s largest analytical chamber with 20 ports available

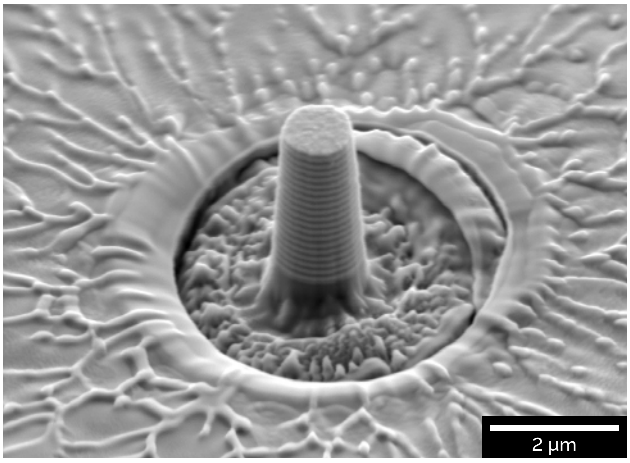
Robust, Multiple Application Powerhouse



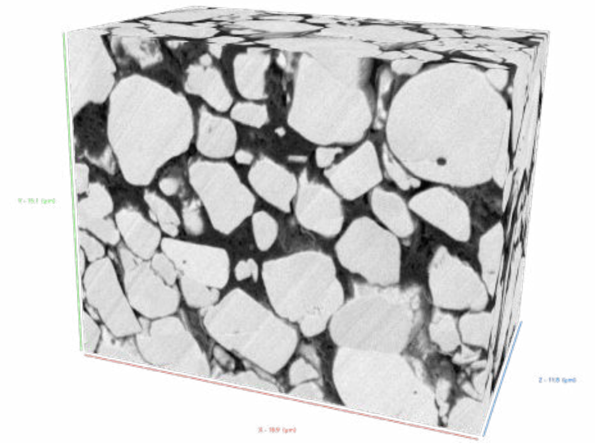
▲ Ultra-high-resolution imaging and microanalyses mesoporous silica SBA-15



▲ Routine and advanced TEM lamella preparation (with automated TEM sample preparation through the undercut step).



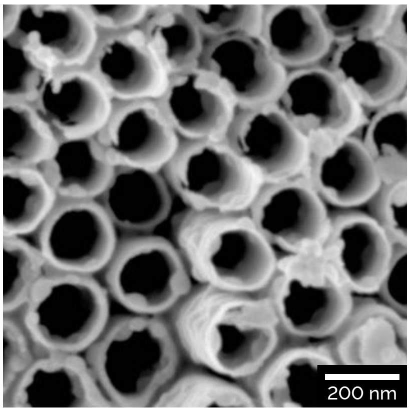
▲ Fabricated pillar by FIB for mechanical test from Ti-Ni multiplayer material



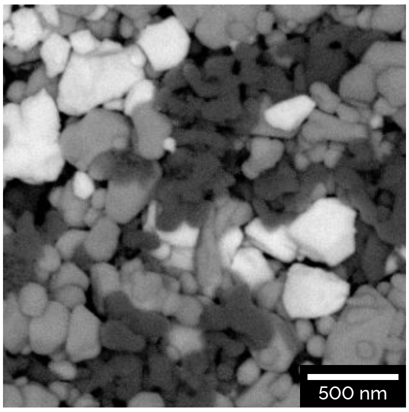
▲ 3D FIB-SEM tomography of Lithium Nickel Manganese Cobalt Oxide layer from battery cathode material

Proven performer in Materials Science

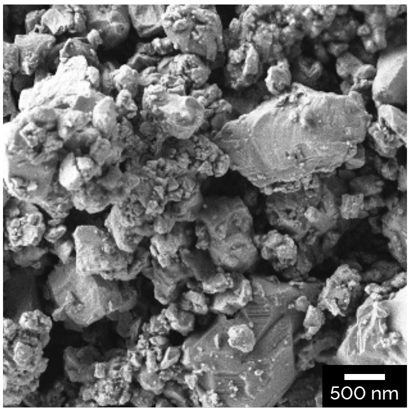
Low energy, ultra-high-resolution SEM imaging



▲ TiO_2 nanotubes imaged at 2 keV with Beam Deceleration technique to get an improved resolution to clearly analyze details of tube's walls.

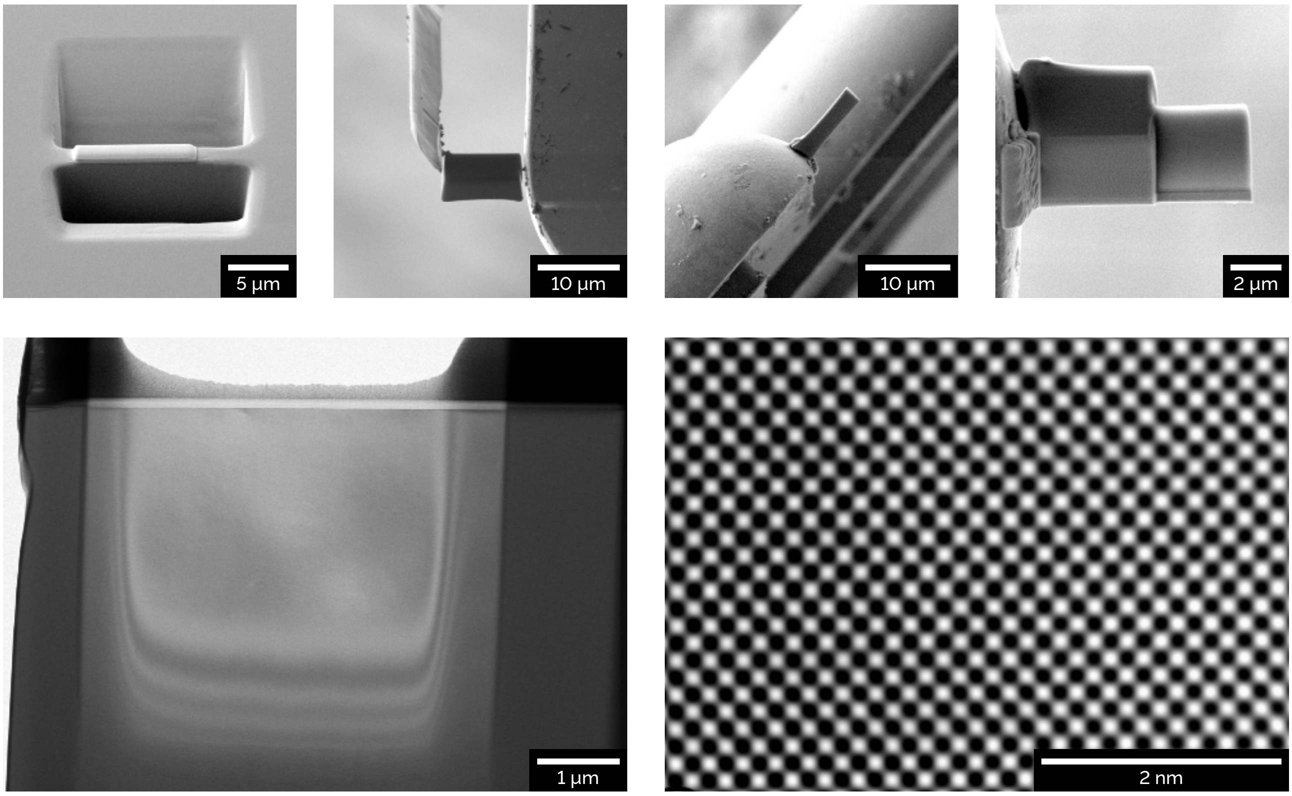


▲ Carbon-supported palladium catalyst, image showing clear material contrast between Pd (Bright) and carbon (dark) nanoparticles. Captured at 5 keV with Axial BSE detector.



▲ High resolution image of magnetic tungsten carbide powder imaged at 2keV with chamber E-T SE detector to capture sample's topography more in detail.

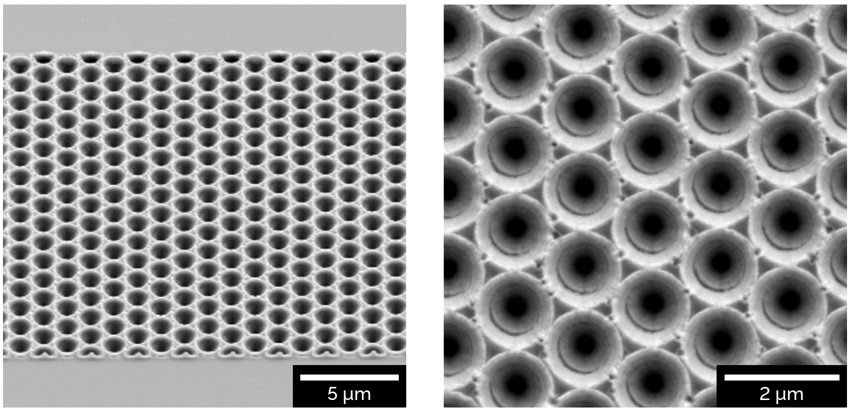
Sample preparation



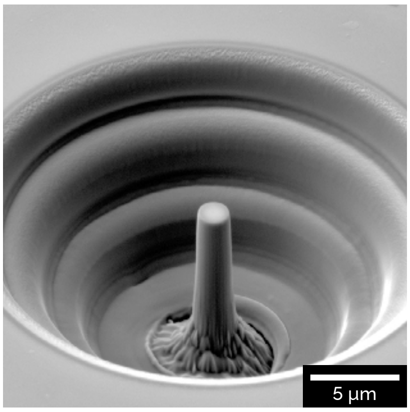
▲ Preparation of inverted TEM sample from silicon at [100] orientation, utilizing patented hardware positioning for advanced geometries. **Bottom left:** overview TEM image.
Bottom right: HAADF image of silicon atoms at [100] orientation.

The highly versatile AMBER brings value to any materials lab through its ability to address multiple applications and process a variety of sample types with little or no additional preparation.

Nanofabrication

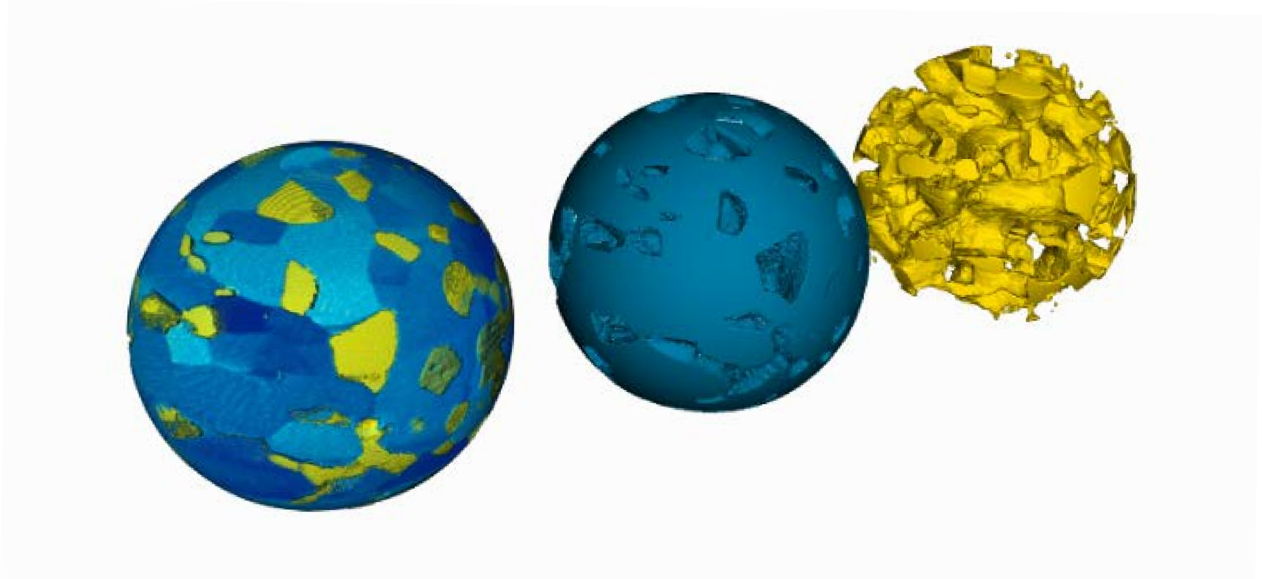


▲ Hydrophobic structure used for imprinting, overview and detail images.

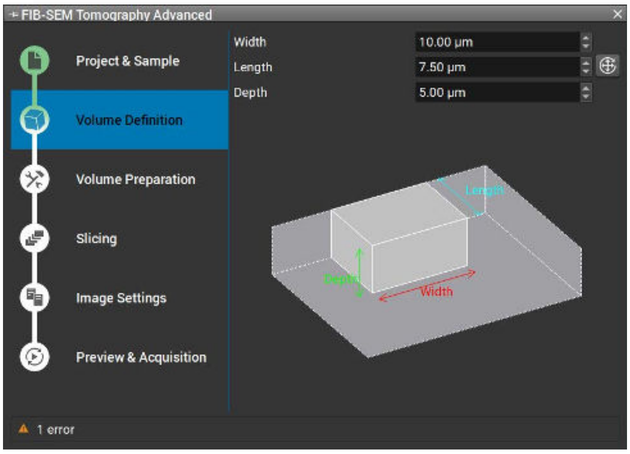


▲ Nanofabricated pillar for mechanical testing on molybdenum sample

3D EDS/EBSD FIB-SEM tomography



▲ 3D visualization of solder paste powder balls using FIB-SEM Tomography Essence™ software module. Two Phases of solder paste powder balls are segmented and visualize by visualization software and segmented based on different material contrast.


FIB-SEM Tomography Advanced

Width 10.00 µm
Length 7.50 µm
Depth 5.00 µm

1 error

◀ User-friendly software interface guiding the user through each step with the ability to automate 3D analysis or individual steps.

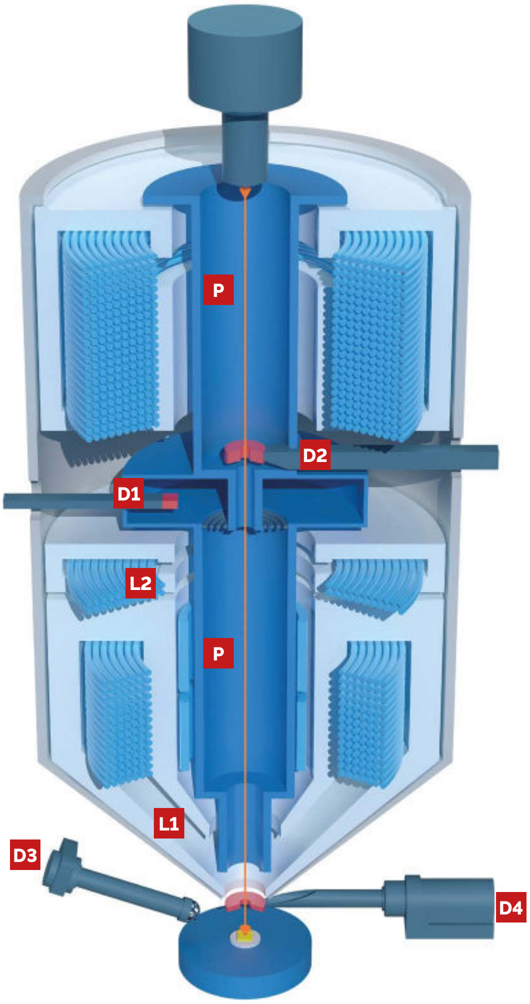
The Technology behind TESCAN AMBER FIB-SEM

TESCAN AMBER is designed to serve multiple applications efficiently and is built with technologies that support nanoscale resolution imaging, high quality analysis and precise sample preparation on a variety of samples.

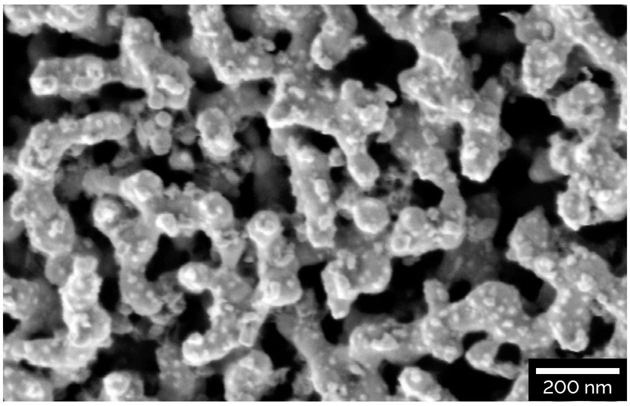
Field-free UHR SEM with BrightBeam™

AMBER's field-free UHR SEM column improves low keV performance to achieve ultra-high-resolution images, even at beam landing energies as low as 50 eV. TESCAN AMBER's BrightBeam™ technology can be applied as needed to not only facilitate large field of view navigation, but also assure trouble-free, high-quality imaging on the widest range of samples, whether metallic, magnetic, non-conductive, charging or beam sensitive. BrightBeam™ also supports high currents required for EDS and EBSD analyses and EBSD analyses up to 400 nA.

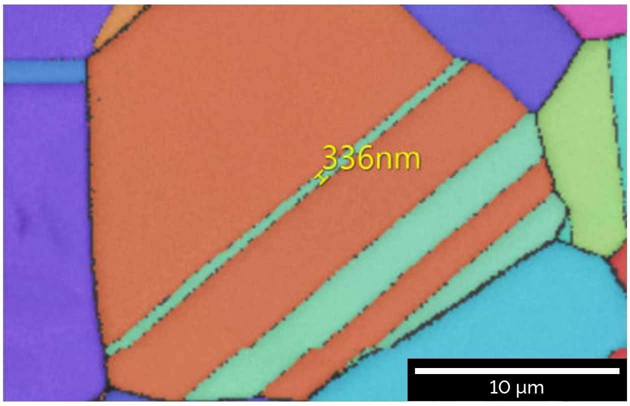
L1	Compound magnetic electrostatic final lens	**D2**	In-column SE/BSE Axial detector
L2	Intermediate lens	**D3**	Everhart–Thornley SE detector
P	Potential tube	**D4**	Retractable BSE detector
D1	In-column SE Multidetector		



Beam Deceleration Technology (stage bias 5 keV)*
* Optional equipment



▲ High magnification image of nanoporous gold sample imaged at 1 keV for more detailed information from the sample's surface



▲ EBSD - Beam optimized for high beam currents (20kV ~20nA)

Signal Detection System

TESCAN AMBER includes four detectors as standard: in-column SE and BSE detectors, and chamber-mounted SE (Everhart-Thornley) and retractable BSE detectors. Each of these detectors can be used individually or in combination to capture clear, detailed images from your samples. In-column detectors are best suited for detailed high resolution SE imaging requirements due to their improved surface sensitivity. TESCAN's in-column detectors can acquire both SE and BSE signals simultaneously, even to collect data of the FIB process during FIB-SEM operations.

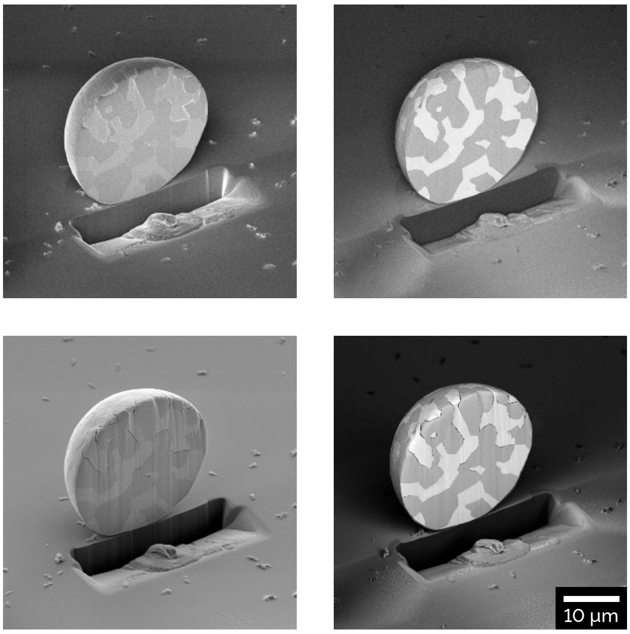
The chamber mounted detectors deliver higher contrast and more detailed topographic information and because of their design, can be used for the most standard FIB-SEM operations. The unique ability to combine topographic information with the high efficiency signal collection from the chamber BSE with the high surface-sensitivity information collected from the in-beam BSE and SE detectors allows TESCAN AMBER to reveal information from different perspectives for a better understanding of the sample properties.

In-column SE Multidetector

D1

In-column SE/BSE Axial detector

D2



Everhart–Thornley SE detector

D3

Retractable BSE detector

D4

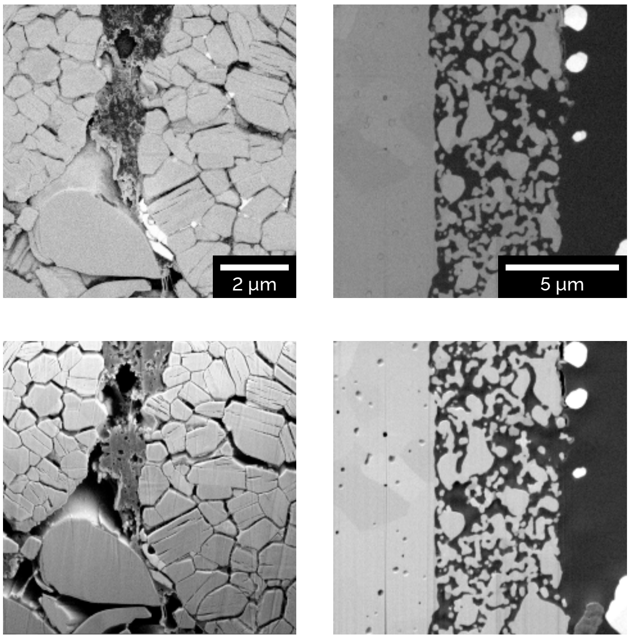
◄ Comparison of image contrast levels provided by AMBER's standard detectors, as shown on a solder paste powder ball. Detector signals acquired individually or in combination.

In-column SE/BSE Axial detector

D2

Retractable BSE detector

D4



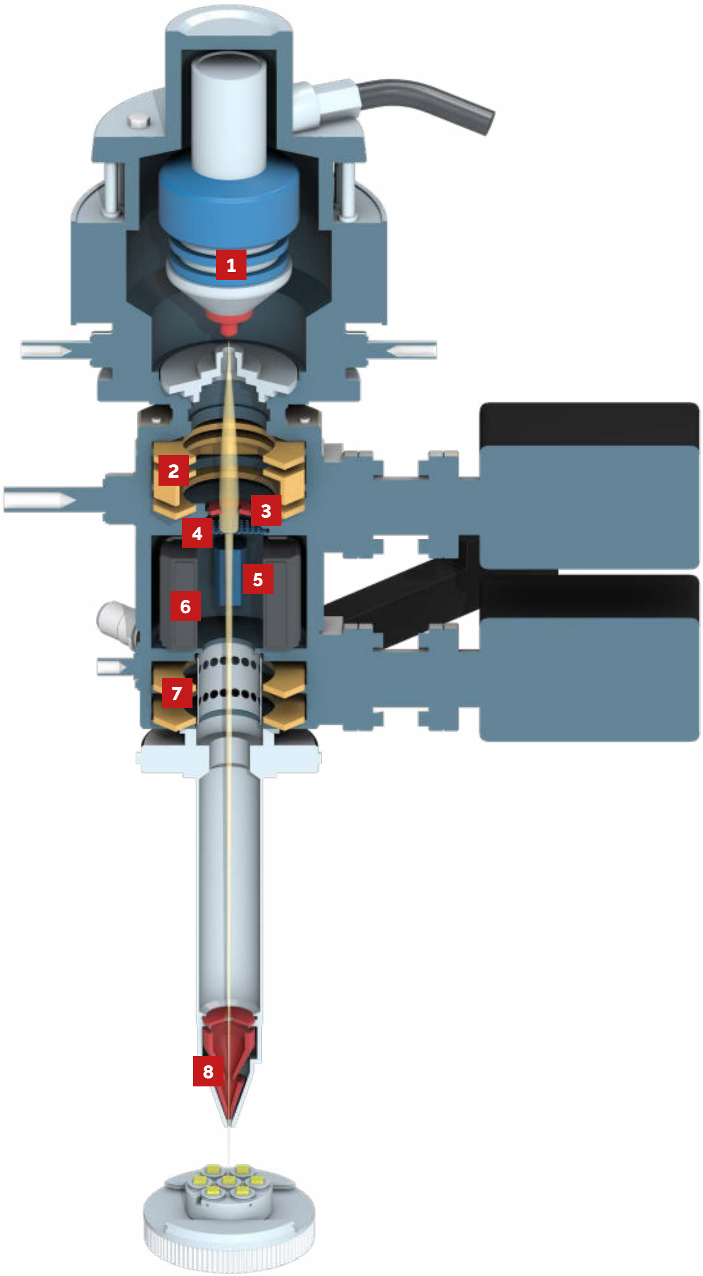
◄ Comparison of BSE signals from In-column BSE and Chamber-mounted BSE detectors on two different sample types.

Upper left: Li cathode with enhanced material contrast on small particles when the In-column BSE detector is used.

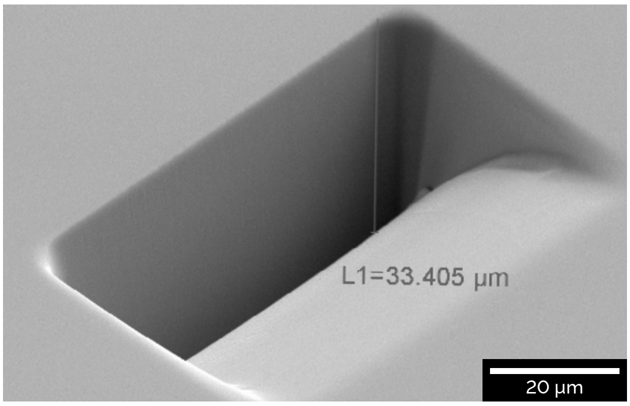
Lower right: The Chamber-mounted BSE shows improved contrast in the porous part of an SOFC sample.

Orage™ FIB Column

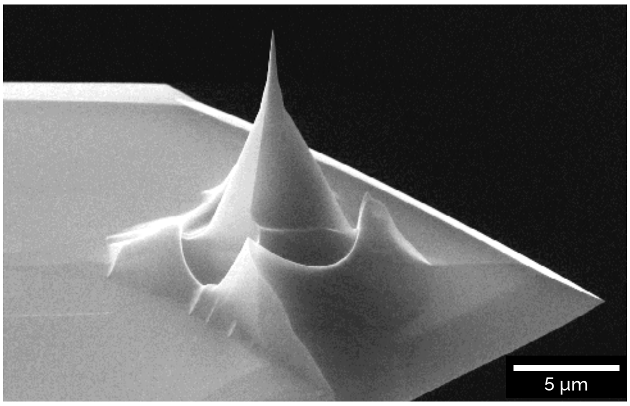
With best-in-class resolution and beam currents to 100 nA, Orage™ handles all FIB milling requirements with ease, whether it is cross-sectioning to reveal buried features for further analysis or tomographic studies, or precisely preparing high-quality TEM samples from trench, to undercut, to final polishing at low keV. This high precision Ga FIB column also capably handles FIB-induced material deposition and pattern milling and deposition for micro-structure fabrication.



1	Ion gun
2	Condensors lens
3	Gun valve
4	Piezo-driven apertures
5	Beam Blanker
6	Faraday Cup
7	Scanning and stigmator octupoles
8	Objective lens



▲ Fabrication of large cross section on silicon sample using high current FIB (100 nA).
Size: 75x50x33 µm; time: 17 minutes.



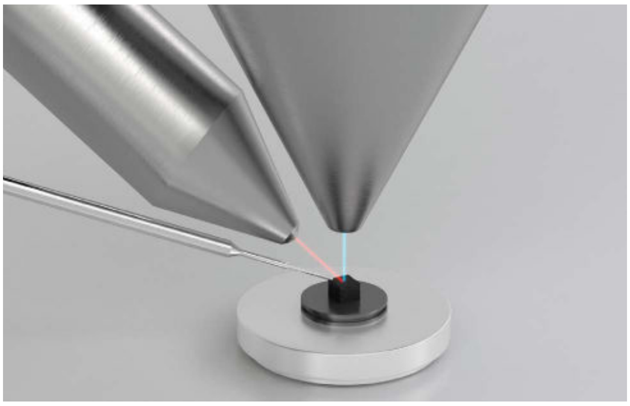
▲ AFM probe tip modification by FIB or FEBID aproach for deep hole profile measurement. The final radius achieved this method is in range of nanometers. These techniques can be used for different SPM probe tips modification (MFM, KFM, STM, SNOM, etc.)

Go Beyond the Routine

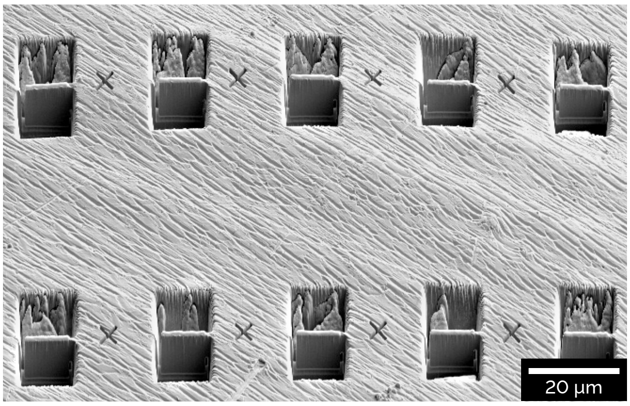
AMBER FIB-SEM is a highly customizable instrument
that can be configured for all the tasks
that you might possibly need to perform.

Advanced TEM Sample Preparation with TESCANs Unique Lift-out Solution

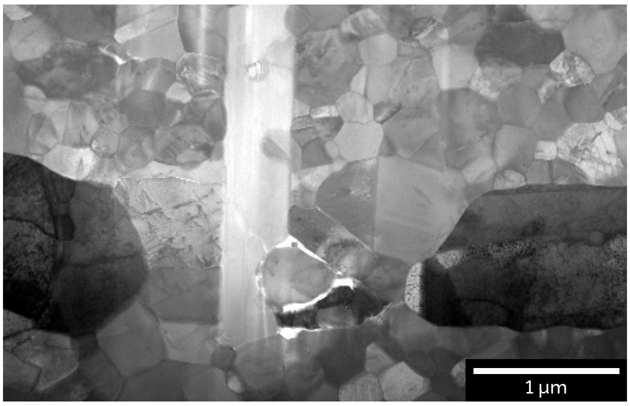
TESCAN AMBER is configurable not only for routine TEM sample preparation, but also for more stringent sample preparation requirements. For standard top-down TEM sample preparation workflows, TESCAN offers the optional AutoSlicer™ module and the integrated TESCAN Nanomanipulator, which utilizes vector-in-window control for easy and intuitive manipulation. For more advanced workflows, a rotatable nanomanipulator is placed in a unique, patented position below the FIB to allow preparation of planar, inverted, and other types of TEM samples without breaking vacuum. And for the applications that require sample handling at cryogenic conditions, TESCAN is compatible with several third-party manipulators, including a cooled version for cryo sample lift-out.



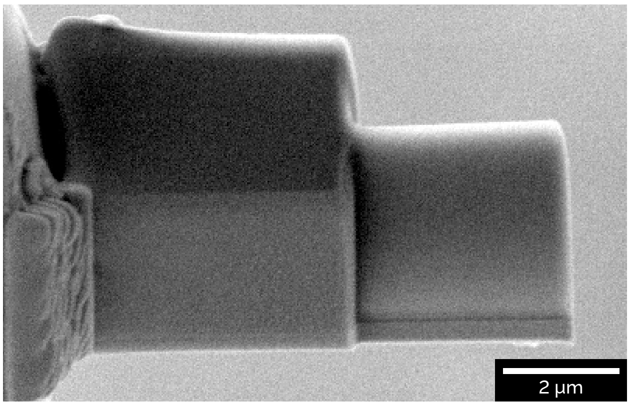
▲ Rendering shows the unique, patented position of the nanomanipulator below the FIB. This position allows sample preparation of planar, inverted and other types of TEM samples with unique geometries.



▲ Array of TEM samples on a copper sample following automated preparation that included the undercut in the trench.



▲ Defect located in a specific plane is analyzed using AMBER's STEM detector. Using FIB-SEM to prepare as a planar TEM sample revealed more information about the defect than when standard TEM sample preparation is used.



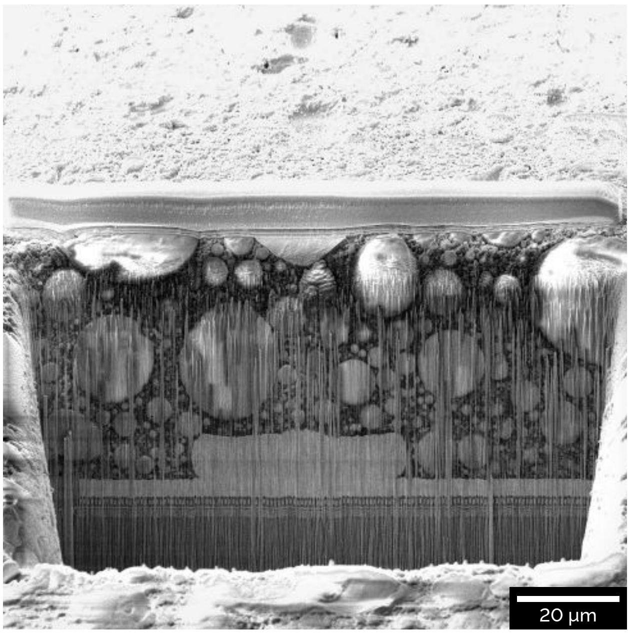
▲ Inverted TEM sample prepared with the nanomanipulator rotated to the required position, streamlining the workflow for high quality, ultra-thin TEM sample preparation.

Artifact-free Sample Polishing with TESCAN Rocking Stage

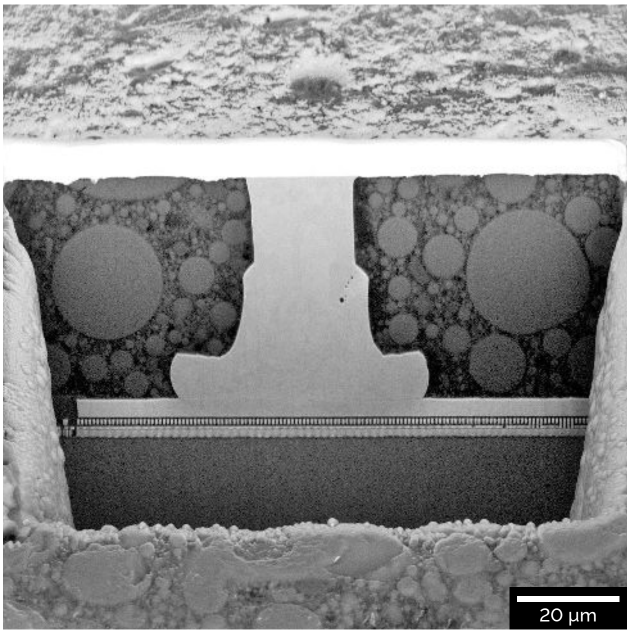
Eliminate curtaining artifacts and accelerate sample polishing with the optional TESCAN Rocking Stage, a sub-stage that allows additional sample tilt. TESCAN Rocking Stage facilitates sample polishing from different directions to remove curtaining effects, even at higher polishing currents. This additional tilt at specific and controllable geometries helps to remove the artifacts from the polished surfaces without the need to interrupt the polishing process.

TESCAN Rocking Stage offers benefits for several applications. For 3D tomography, the unique sample orientations achievable with the Rocking Stage plus automation make artifact-free volume slicing faster and easier. With the Rocking Stage orienting the sample at the correct milling angles to improve surface quality, it is possible to perform milling at higher speeds.

The Rocking Stage also provides advantages for fabricating mechanical testing samples. The additional tilt allows precise visual control during the fabrication process, making it easier to prepare specific shapes or objects with stringent specifications. And, the technique of rocking polishing also can be applied during TEM sample preparation, to eliminate artifacts on samples prone to excessive curtaining for which standard milling methods are not bringing satisfying results.



▲ Surface of a large cross section following rough trench milling with the highest FIB current (100 nA) for faster material removal.

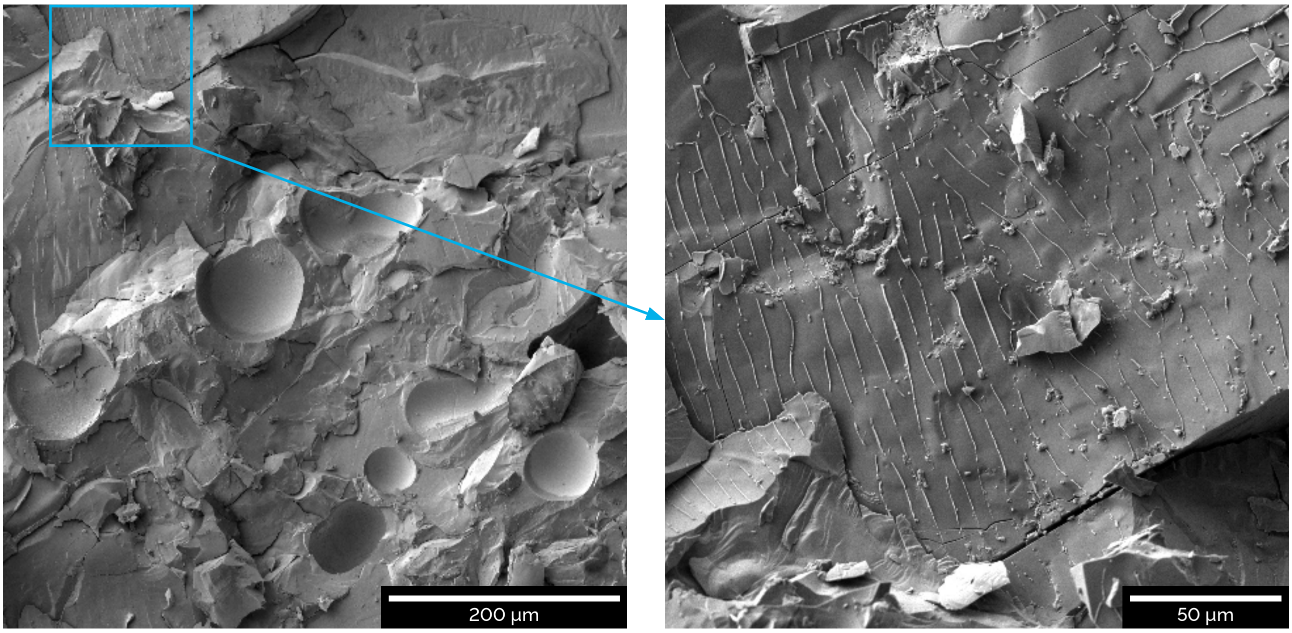


▲ Surface of a large cross section polished by combining 20 nA FIB current and rocking polishing. Rocking polishing allows higher FIB currents to be used for final polishing which significantly speeds total analysis time.

Beam Sensitive and Cryo Sample Characterization

TESCAN AMBER's SEM column design and detection system is already optimized for beam sensitive sample observation; however, there are still cases in which low keV imaging alone is insufficient for imaging certain insulating or outgassing samples. TESCAN AMBER can be configured with TESCAN MultiVac to enable low vacuum and extended-variable pressure chamber environments operating in both N_2 and H_2O atmospheres. MultiVac also includes a Gaseous Secondary Electron Detector (GSD) which, when used in H_2O atmosphere, enables high resolution imaging at low keV and low beam currents for topographic characterization on beam sensitive samples. Use TESCAN's own low energy BSE detector to acquire both detailed topographic (SE) and material contrast (BSE) information in low vacuum and at low landing energies. Any charging that might occur during FIB operation can be mitigated by a flood gun option.

Beam sensitive, soft or liquid/semi-liquid samples materials can be preserved by characterizing them under cryogenic conditions. Adding a cryo stage enables very low keV imaging for such samples as well as allowing FIB cross sectioning, TEM lamella preparation or 3D tomography.

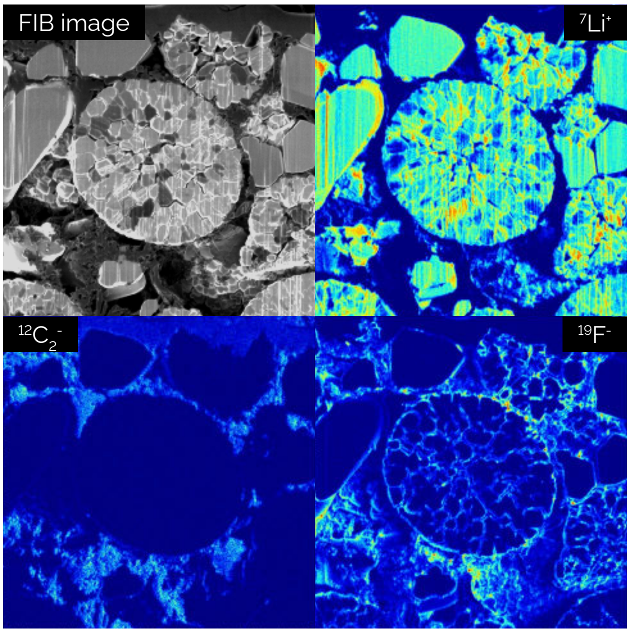


▲ Frozen fracture surface of coloidal polymer, cryo-prepared at -95° C and sputter-coated with Pt

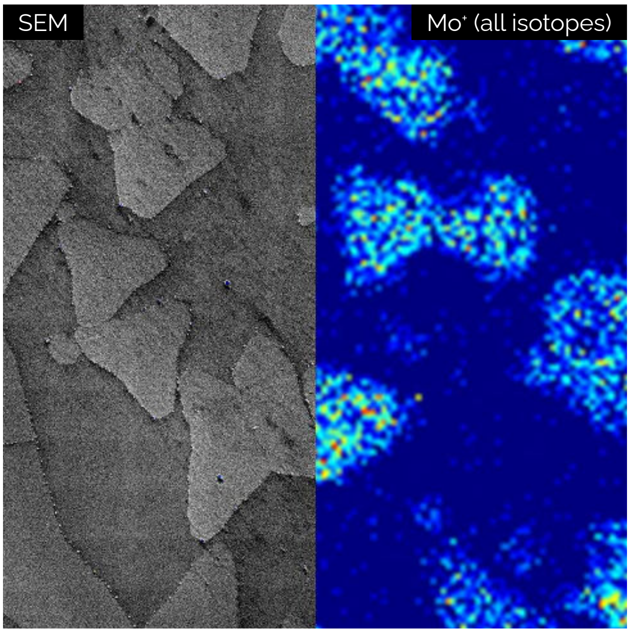
Light Element Analysis with ToF-SIMS

Add capability for analysis of light elements, even hydrogen, and for trace concentrations of elements with optional, integrated Time-of-Flight Secondary Ion Mass Spectrometry (ToF-SIMS). High-sensitivity ToF-SIMS analysis enables study of the distribution of individual elements, their isotopes, clusters and molecule fragments. In contrast to EDX, ToF-SIMS is sensitive to lithium making it indispensable for use in Li-ion battery research.

In combination with Orage™ FIB column, ToF-SIMS provides both high spatial resolution mapping and high depth resolution depth profiling at the nanoscale. The advantage of adding ToF-SIMS to FIB-SEM are that the SEM handles high-resolution, non-destructive navigation over the sample surface, while the FIB can be used to prepare a sample a from localized area, after which ToF-SIMS analyses can take place on the sub-surface structures.



▲ ToF-SIMS data showing the distribution of light elements as Li, C, and F from Li-battery sample.



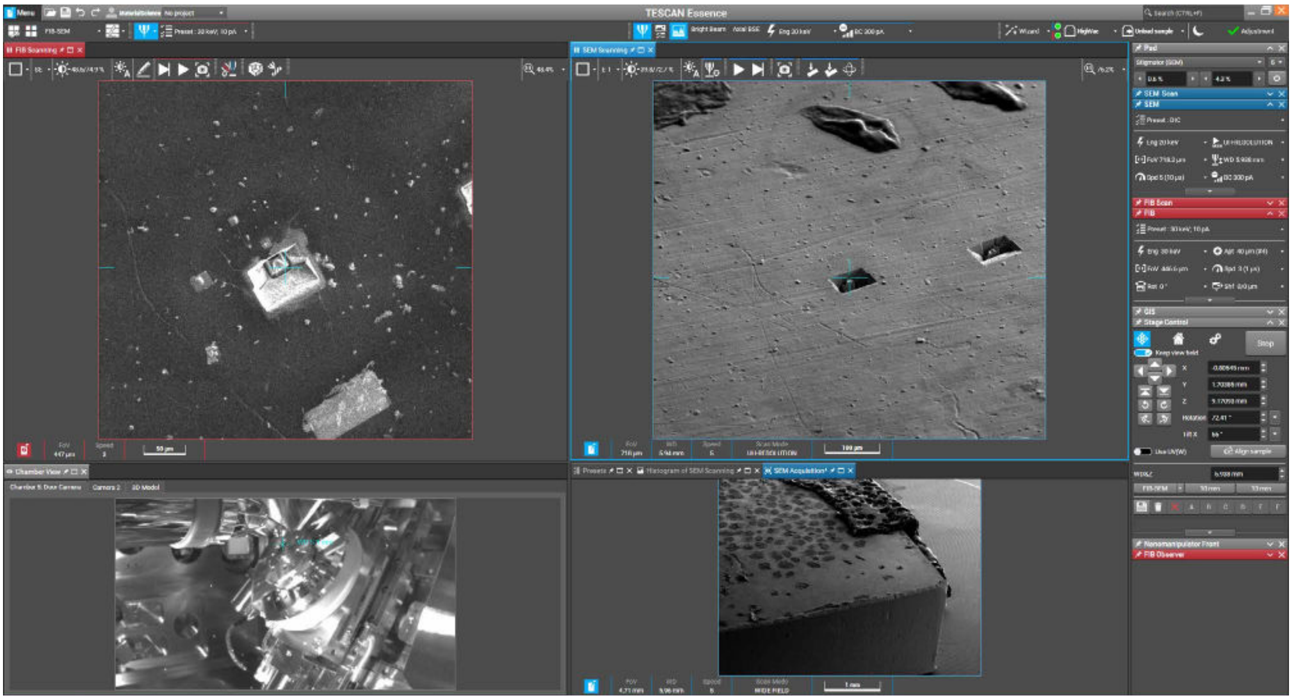
▲ High surface-sensitivity chemical mapping analysis of MoS_2 monolayer flakes on a substrate using ToF-SIMS integrated on FIB-SEM.

TESCAN Essence™ Graphical User Interface: The Heart of TESCAN SEM and FIB-SEM Instruments

All the imaging and analytical power in a microscope may be meaningless if the microscope's user experience is difficult to use. TESCAN Essence™ was built to bring all microscope functions into an easy-to-learn graphical user interface, with all operations performed from a single live view window. Guided workflows assure consistency in the execution of routine imaging and analytical tasks. Advanced modules offer additional control over microscope parameters for more complex investigations.

Essence™ software for Ease of Use

In core facilities and multi-user labs, the experience levels of individual microscope users may vary from novice to expert. TESCAN Essence™ offers an easy-to-learn, user-friendly interface, with built-in, application-oriented guided workflows to assure that all users can perform assigned tasks easily, regardless of their level of expertise.



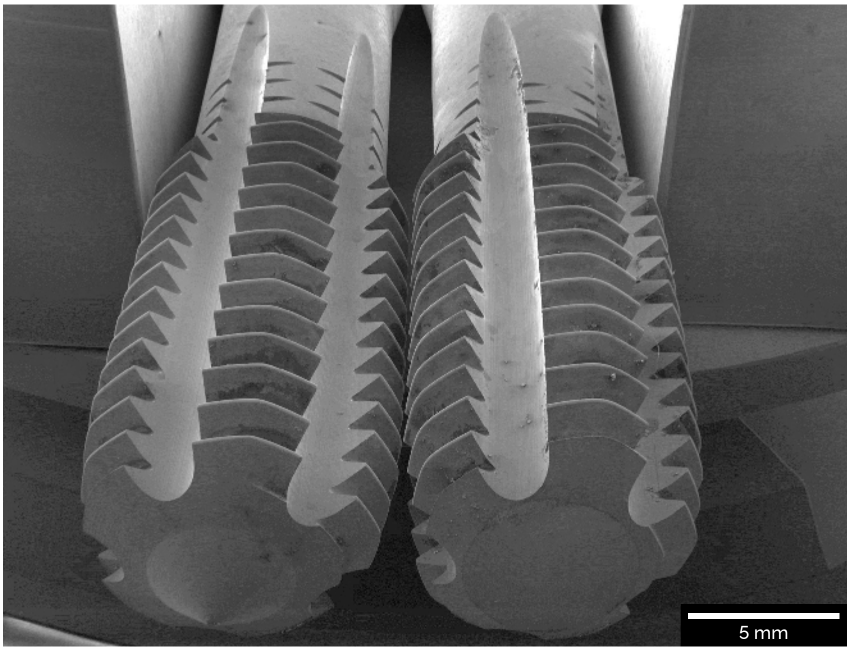
▲ Example of Essence™ software layout for standard FIB-SEM operations. Layouts can be personalized to a users' preferences or to streamline workflow execution. This layout shows both SEM and FIB windows and the camera view to guide live movement in the chamber. The microscope can be controlled using the icons above the SEM and FIB windows, or from the panel on the right.

Essence's modular, customizable layout allows lab managers to tailor the user interface for both the task at hand and an individual users' comfort level with the technology. TESCAN Essence™ also supports custom scripting so you can develop guided workflows that match your routine imaging and analysis tasks.

When you start Essence™, you see that everything is accessible from a single live imaging window. The task-specific interface means that only the settings you need for your work are on the screen. For example, if you are doing an SEM investigation, the user interface will contain only those controls for SEM.

Wide Field Optics™

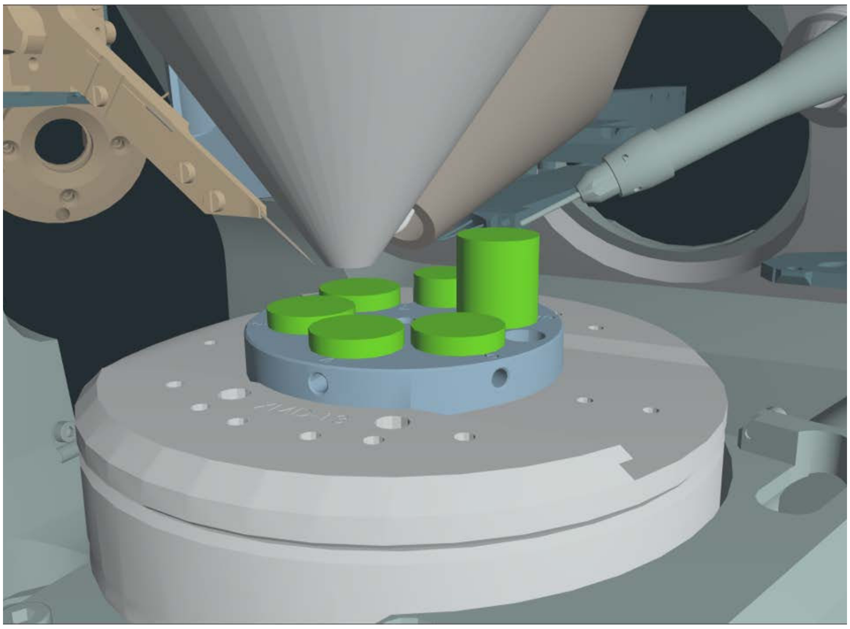
Wide Field Optics™ mode provides an intuitive navigation experience with the industry's widest undistorted field of view, displayed in the live SEM imaging window. The view of the samples is photorealistic, with unprecedented depth of focus, to allow fast and precise navigation to areas of interest on both planar and tilted samples. TESCAN's Wide Field Optics™ mode is standard on all TESCAN SEM and FIB-SEM instruments.



▲ Overview image of cutting tools captured with the Wide Field Optics™ function for precise and easy navigation over large samples.

Essence™ 3D Collision model

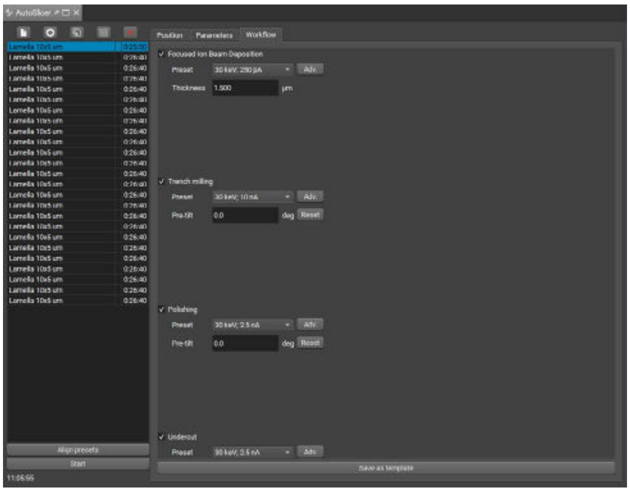
TESCAN's Essence™ 3D Collision model is another standard Essence™ software module designed to remove the fear factor from one of the more intimidating aspects of using a SEM or FIB-SEM: the possibility of crashing the sample and/or stage into other chamber hardware like detectors, gas injectors or even the column itself. The Essence™ 3D Collision Model replicates the chamber interior and predicted stage and detector motion, creating a virtual model that helps users adjust hardware positions for collision-free movements. Users can preview the movements of the stage, sample tilting and the extension or retraction of detectors or other chamber hardware prior to imaging and analysis.



▲ The 3D Collision model shows blocks representing the dimensions of samples on the stage, as well as showing other hardware components, to provide a virtual view inside the chamber for collision avoidance.

AutoSlicer™

TESCAN's AutoSlicer™ automates the initial steps in the TEM sample preparation workflow: navigation to regions of interest, protective layer deposition, trench milling, polishing and finally the undercut to release the sample from the trench. This speeds preparation time, assures sample uniformity, and alleviates concerns that samples may not meet the quality requirements for subsequent imaging and analysis. Following these steps, AutoSlicer's semi-automated workflows guide users through lift-out, attachment of the lamella to the TEM grid, and final FIB polishing. AutoSlicer also supports inverted and planar sample preparation, and automated FIB cross sectioning at multiple sites. Users can develop custom workflows unique to their samples which are then saved within AutoSlicer™ and recalled as needed.



Lamella 10x5 um 0:26:40
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Lamella 10x5 um 0:26:40
Lamella 10x5 um 0:26:40

✓ Focused Ion Beam Deposition
Preset 30 keV; 250 pA
Thickness 1.500 µm

✓ Trench milling
Preset 30 keV; 10 nA
Pre-tilt 0.0 deg

✓ Polishing
Preset 30 keV; 2.5 nA
Pre-tilt 0.0 deg

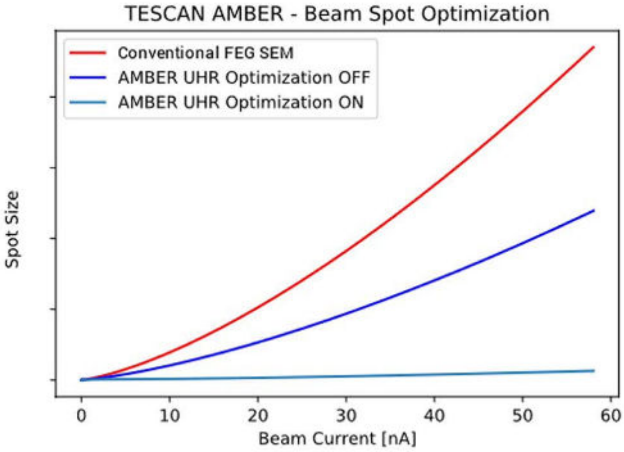
✓ Undercut
Preset 30 keV; 2.5 nA

11:06:55

▲ Autoslicer module allows automated cross-section preparation and semi-automated TEM sample preparation. The process of TEM sample preparation can be modified for a specific task and saved to the library for later use. The process of TEM sample preparation is automated through the undercut step.

In-Flight Beam Tracing™

In-Flight Beam Tracing™ uses multiple parameters to calculate the best possible settings for a selected landing energy and the optimal imaging or analytical working distance. The software uses an intuitive process that allows even novice users to select the ideal beam conditions for a given application. TESCAN's SEM column design, in combination with In-Flight Beam Tracing™, allows setting the optimum beam current without limitations and without the necessity to change apertures. Optimal analytical conditions are easily selected by combining the parameters as landing voltage, current and working distance. In addition, this approach to beam control is beneficial when conditions from a previous measurement need to be restored.



▲ In-Flight Beam Tracing™ and Intermediate lens (IML) enable aperture / spot size optimization for high beam currents

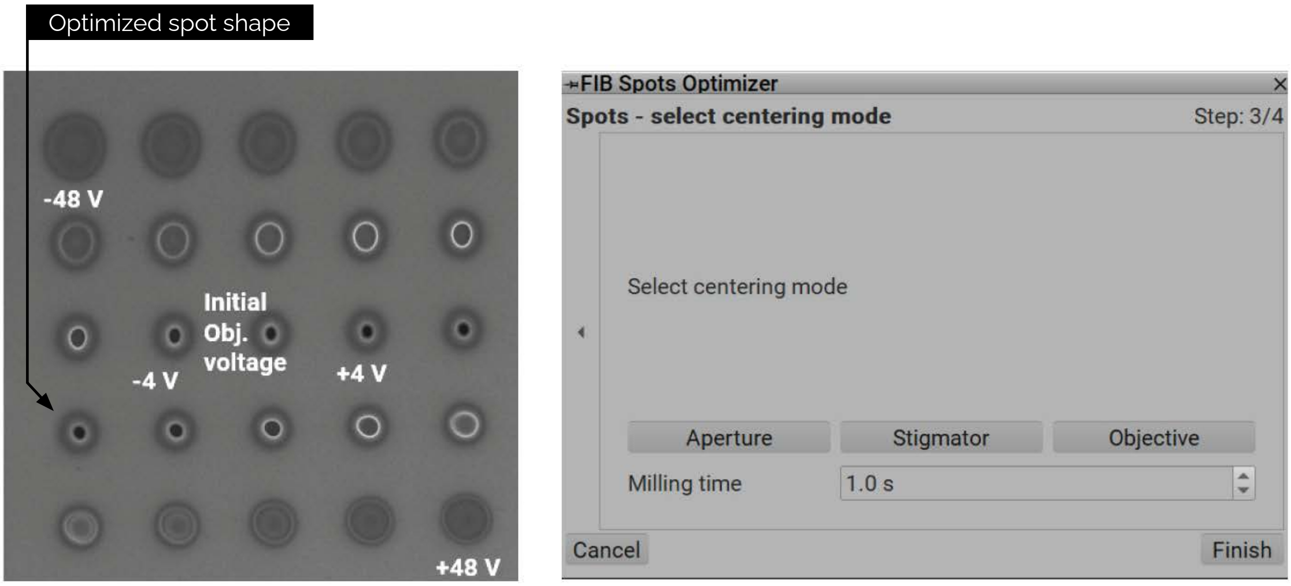
Essence™ for Experts

TESCAN Essence™ isn't only about making microscopy easy for new users. The GUI also provides sophisticated software modules to allow advanced users to control specific operational parameters to suit a particular application. Here are some of the commonly selected advanced modules for TESCAN AMBER FIB-SEM.

Beam Set-up Control Wizards

With the spot size of electron beam set and controlled by In-Flight Beam Tracing™, the optimal beam parameters can be achieved easily to serve all applications. The specific design of TESCAN's electron optics allows changing the beam current continuously while the beam parameters are still automatically controlled by In-Flight Beam Tracing™.

To achieve the optimal focused ion beam profile, users apply a semi-automated procedure to precisely tune the beam to the most preferable currents for the application. This capability to tune FIB profiles is beneficial for applications in which a specific beam size is essential, such as patterning applications or for sample preparation from specific materials that are difficult to mill or are prone to artifacts.



Select centering mode

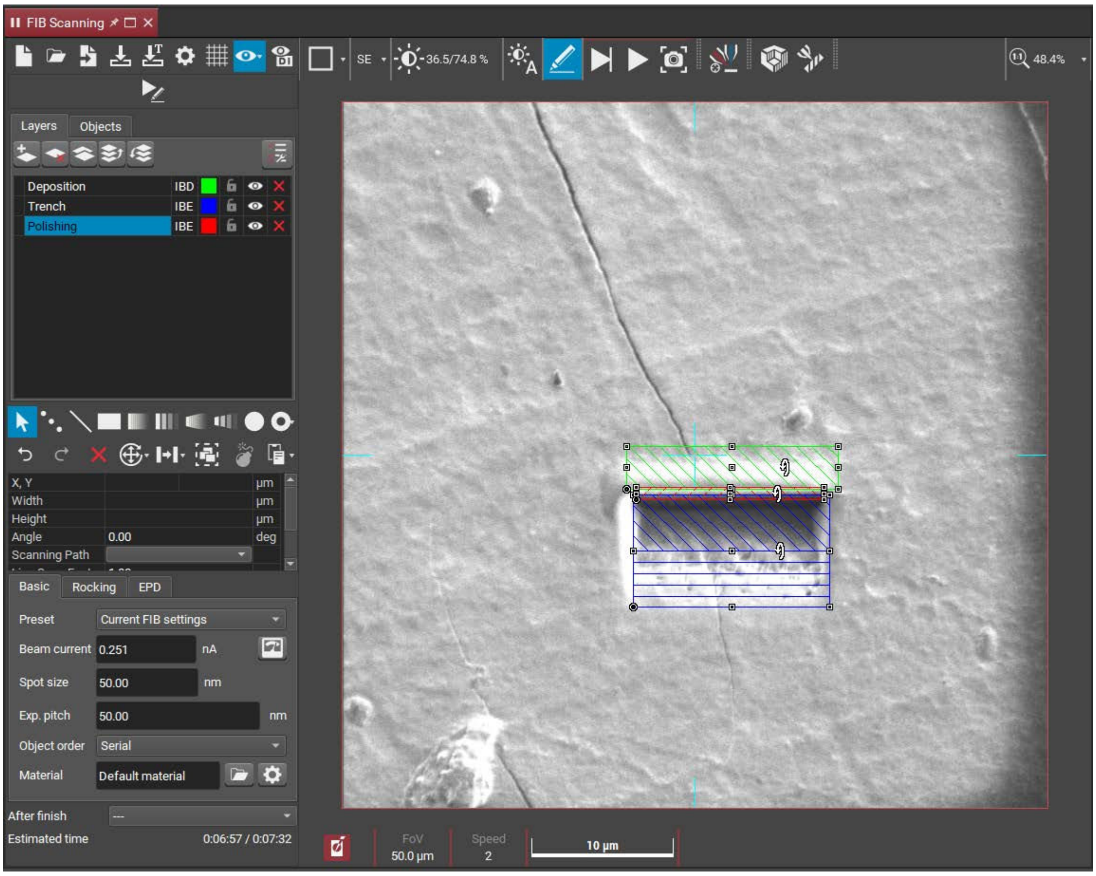
Milling time 1.0 s

▲ The FIB Spot Optimizer helps users adjust beam parameters to fit a particular application or task. (left) Matrix of FIB beam spots milled into silicon sample. (right) User interface showing available FIB parameters for which the value can be optimized by the wizard. Select only one value or all values.

Essence™ DrawBeam

DrawBeam controls both the ion and electron beams for high precision nanopatterning. The software supports all the basic operations for standard FIB-SEM applications, such as cross-sectioning and sample preparation for TEM, and atom probe tomography or mechanical testing, while also handling advanced operations like patterning and creating advanced structures by combining FEBID, FIBID and FIB milling processes. Basic patterning control for common applications is accessed directly from the live SEM scanning window. For advanced patterning tasks, the DrawBeam Automate module extends the capabilities of the software to include batch processing or multi-site automation. All created patterns can be stored in separate layers, with process steps and beam conditions defined.

DrawBeam precisely controls not only beam positioning but also beam interaction with the sample surface. This helps define the milling strategy because the direction of milling is crucial for producing homogeneous structures, especially important for nanoprototyping. This function can be beneficial for minimizing beam damage when milling beam sensitive samples. By using DrawBeam to specify the number of beam passes, you can limit sample damage by exposing the scanned area for shorter durations.



Layer		
Deposition	IBD	🟩
Trench	IBE	🟦
Polishing	IBE	🟥

X, Y µm
Width µm
Height µm
Angle 0.00 deg
Scanning Path

Preset: Current FIB settings
Beam current: 0.251 nA
Spot size: 50.00 nm
Exp. pitch: 50.00 nm
Object order: Serial
Material: Default material
After finish: ---
Estimated time: 0:06:57 / 0:07:32
FoV 50.0 µm
Speed 2

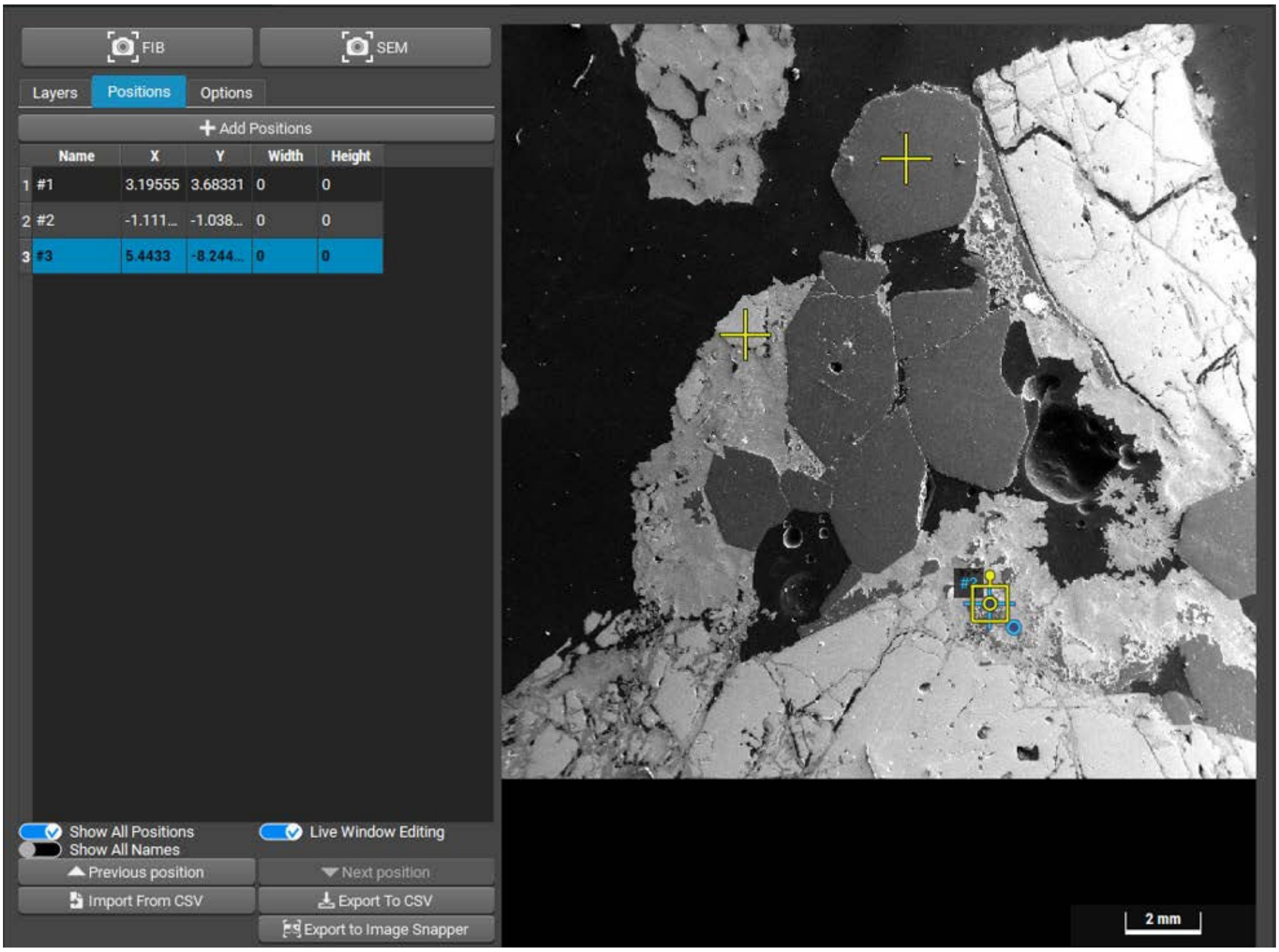
▲ Essence's DrawBeam module enables precise definition of beam position and defines objects for etching or deposition using both the electron and/or ion beams. Projects can be saved for future repetitive workflows.

Python Scripting

TESCAN Essence supports Python scripting, which can take microscope automation to a new level. Experienced users can develop custom scripts to enable advanced functionality and control over microscope operations. Scripts are mainly used for non-standard procedures or applications, as well as in cases when the microscope is configured to a specific application, and it is advantageous for all users to follow the exact same procedures. Also, Python scripts can be used to control both the electron and ion beams to enable creation of complex 3D structures. And, when analyzing specific samples for which the orientation and size of structures of interest can be distorted in a standard configuration, Python scripting can be used to define parameters for 3D reconstructions in non-standard orientations.

Essence™ Positioner Module

The Positioner module facilitates sample navigation and correlative workflows by automatically overlaying and aligning images from multiple sources. Work from a macro-scale image acquired in TESCAN's Wide Field Optics™ to obtain an overview of the entire sample. The image is automatically calibrated, then can be used for navigation at higher magnification to arrive at the exact region of interest. Or, for a specific target area that is more visible using light microscopy, use an image from an optical microscope to guide navigation to the area of interest. Optical microscope images can be used to protect beam sensitive samples from damage induced by the ion or electron beam during navigation. The Essence™ Positioner module also can accept data from other analytical techniques or images acquired at different magnifications, landing voltages, beam currents or with different detectors. These images can be combined using automatic calibration to facilitate navigation to areas of interest identified using other techniques.



	Name	X	Y	Width	Height
1	#1	3.19555	3.68331	0	0
2	#2	-1.111...	-1.038...	0	0
3	#3	5.4433	-8.244...	0	0

▲ Positioner module using overview SEM image captured in Wide Field mode as a reference for navigation over large samples to easily navigate to the areas of interest. As a reference image for navigation the image from other types of microscopes can be used as for example optical microscopy.

Presets

For routine or repetitive analyses, users can save the ideal SEM and FIB operating conditions as presets in Essence. The user can select which parameters will be stored based on the application. Stored presets streamline workflows to make system operation efficient and effective. These custom presets are not limited only to saving the column's optics settings, but also can be used to record the stage position or other image acquisition parameters such as brightness and contrast. Using presets, the best image is only one click away. And the system is capable of extracting settings from images previously acquired by TESCAN instruments and restoring the conditions from selected images as a reference.

TESCAN FIB-SEM Product Portfolio

TESCAN's range of FIB-SEM instruments cover an array of applications in materials science, semiconductors and life sciences

Application recommendation:

Volume characterization

Nano characterization

Technology

Applications

Key application images

TESCAN AMBER X

FIB-SEM for multi-scale, multi-modal characterization with Xe Plasma FIB for large area sample processing and Ga-free sample preparation.

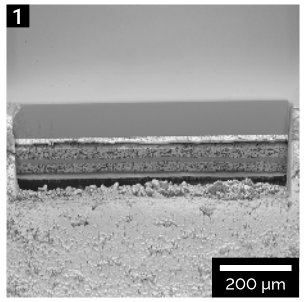
- Materials Science
- Life Sciences
- Earth Science

Technology:

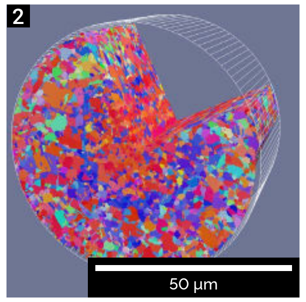
- i-FIB+™ Xe plasma FIB column
- Field-free UHR SEM
- In-Column detectors
- Rocking stage

Applications:

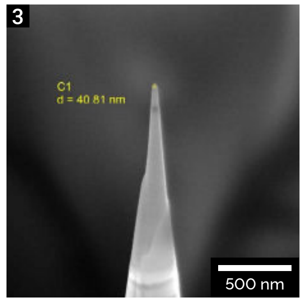
- Large Scale analysis
- FIB-SEM tomography
- Micro analytical characterization (EDS/ EBSD and ToF-SIMS)
- Ga free TEM prep



1 1 mm cross-section through a Li-ion battery electrode



2 Large volume 3D EBSD analysis



3 Ga-free APT sample preparation

TESCAN SOLARIS X

Designed to SEM and STEM imaging, Failure analysis for advanced packaging, Ga-free sample preparation.

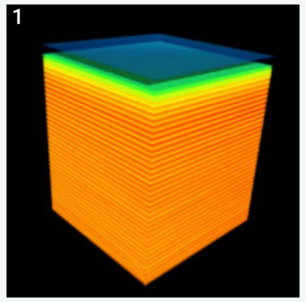
- Semiconductors
- Life Sciences

Technology:

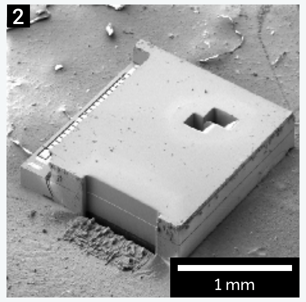
- i-FIB+™ Xe plasma FIB column
- Immersion UHR-SEM
- Selective signal collection
- Rocking stage

Applications:

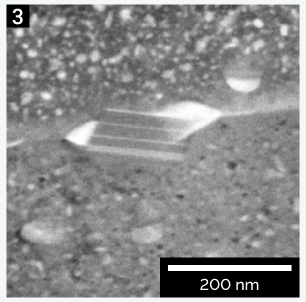
- Ga free TEM prep
- FIB-SEM tomography
- Cross-sectioning
- IC planar delayering



1 3D ToF-SIMS tomography from InAs/GaSb superlattice multilayer sample of layers thickness smaller than 3 nm



2 Cross-section of a sensor, MEMS device



3 Darkfield STEM image of the precipitate at the grain boundary of an aluminium alloy

TESCAN AMBER

Easy to use and versatile FIB-SEM for nanoscale materials characterization and sample preparation on a variety of materials.

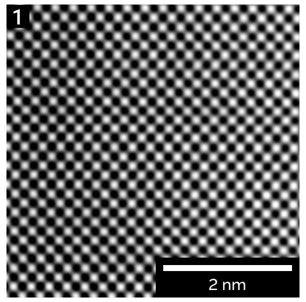
- Materials Science
- Life Sciences
- Earth Science

Technology:

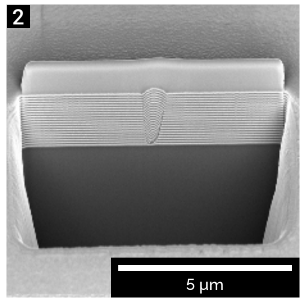
- Orage™ Ga FIB column
- Field-free UHR SEM
- In-Column detectors
- Advanced TEM prep geometry

Applications:

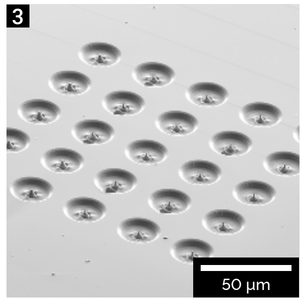
- TEM prep
- FIB-SEM tomography
- Micro analytical characterization (EDS/ EBSD and ToF-SIMS)
- Nanofabrication



1 300 keV TEM image. HAADF STEM image of Si [100] atom structure



2 A cross section through a defect in a multi-layered coating



3 Array of micro-compression pillars

TESCAN SOLARIS

For high resolution SEM imaging, the highest-precision Ga FIB thin lamella preparation, and nano prototyping applications.

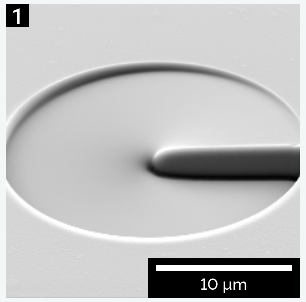
- Materials Science
- Semiconductors
- Life Sciences

Technology:

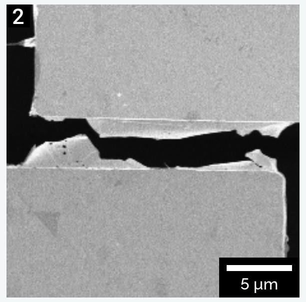
- Orage™ Ga FIB column
- Immersion UHR-SEM
- Selective signal collection
- Advanced TEM prep geometry

Applications:

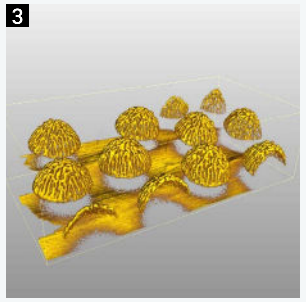
- TEM prep
- FIB-SEM tomography
- E-beam litography
- Nanoprototyping



1 Nanoscale 3D optical vortex structure fabricated using Python scripting



2 In-situ tensile test experiment of a single-layer graphene flake



3 FIB-SEM nanotomography of SERS (Surface-enhanced Raman spectroscopy) substrate

TESCAN NanoSpace

Ultra-High Vacuum FIB-SEM platform for operations requiring a specific level of vacuum, such as modification, analyses or nanoprototyping performed on highly surface-sensitive samples.

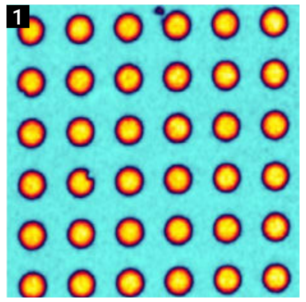
- Materials Science
- Semiconductors

Technology:

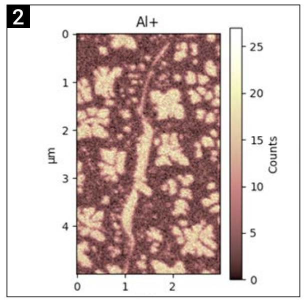
- Three Beam System
- Wien Filter – multi ion species
- Field emission gun
- Ultra-High Vacuum

Applications:

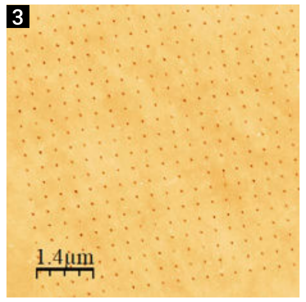
- Nanoanalyses
- TOF-SIMS
- Ion implantation
- Sensitive surface analyses



1 Photoluminescence image of an array of NV centers obtained after implantation in ultra pure diamond single crystal and annealed.

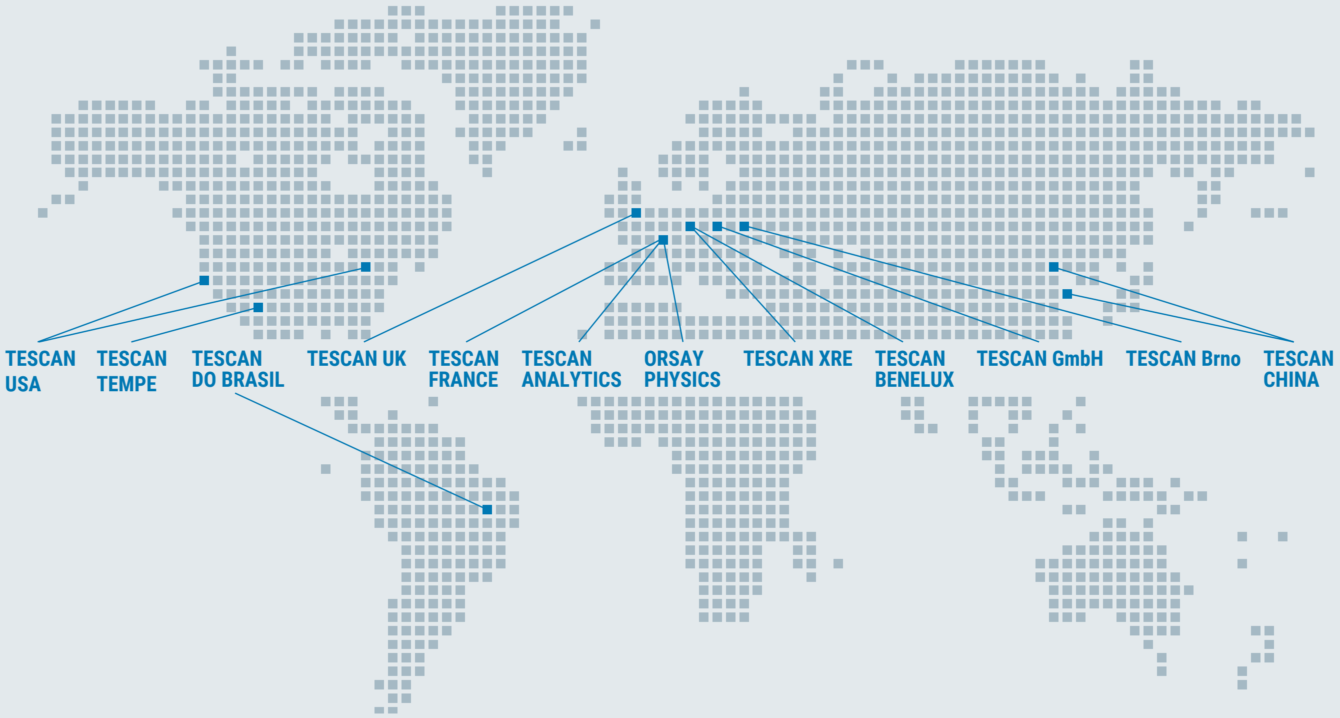


2 SIMS 2D on Ni based superalloys



3 Nano-machining and analysis of SiGe nanowires or Au patterning under clean environment

TESCAN Family Around the World



TESCAN enables nanoscale investigation and analysis within the geosciences, materials science, life sciences and semiconductor industries. The company has a 30-year history of developing innovative electron microscopy, micro-computed tomography, and related software solutions for customers in research and industry worldwide. As a result, TESCAN has earned a leading position in micro- and nanotechnology.

For more information visit: www.tescan.com.

TESCAN ORSAY HOLDING was established in 2013 as a result of long-term expansion and establishment of subsidiaries worldwide, including France-based ORSAY PHYSICS, a world leader in customized focused ion and electron beam technology. TESCAN ORSAY HOLDING maintains its headquarters, production and R&D in Brno, Czech Republic. Every TESCAN microscope is expertly produced in Brno and shipped to customers worldwide.

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